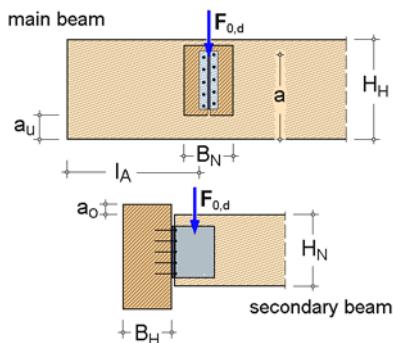


POSITION 20: CONCEALED BEAM HANGER ALU

4H-HOLZ concealed beam hanger connection

(4H-HLZ72 Version: 10/2012-1j) (principle sketch)



calculation bases:

DIN EN 1995-1-1:2010-12 (EC5) /NA:2010-12,

BAZ Z-9.1-290 und ETA-04/0013

sizes of main and secondary beam (single-sided)

$H_H = 320 \text{ mm}$ $B_H = 240 \text{ mm}$ $a_0 = 50 \text{ mm}$

$H_N = 220 \text{ mm}$ $B_N = 120 \text{ mm}$ $a_u = 50 \text{ mm}$

$l_A = 46 \text{ mm}$ $a = 153 \text{ mm}$

service class 2

species/timber grade

main beam: coniferous timber, timber grade C24

secondary beam: coniferous timber, timber grade C24

internal forces and factors

$F_{0,d}$ force parallel to web

combinations of internal forces BT (design values)

LK-Nr.	KLED	$F_{0,d}$	$F_{90,d}$	N_d	k_{mod}
1	permanent	1.50 kN	---	---	0.60

connection method standard concealed beam hanger

make BT concealed beam hanger ALU 120 - 4

conc. beam h. size width $b = 62.0 \text{ mm}$ height $h = 116.0 \text{ mm}$ length $l = 103.0 \text{ mm}$ st.pl.th. $t = 6.0 \text{ mm}$

dowel $dst = 12.0 \text{ mm}$ $l_{st} = 120.0 \text{ mm}$ $Myk = 69.1 \text{ Nm}$

nails CNA ribbed nails 4,0x35 $f_{uk} = 600.0 \text{ N/mm}^2$ $Myk = 6.6 \text{ Nm}$

$d_n = 4.0 \text{ mm}$ $l_n = 35.0 \text{ mm}$ $dk = 8.0 \text{ mm}$ $l_g = 25.0 \text{ mm}$

verifications

combination of internal forces 1 (design values)

LK-Nr.	KLED	$F_{0,d}$	$F_{90,d}$	N_d	k_{mod}
1	permanent	1.50 kN	---	---	0.60

nail anchorage capacities (withdrawal)

main beam $f_{1,k} = 7.595 \text{ N/mm}^2$ $R_{ax,k} = 0.760 \text{ kN}$ $R_{ax,d} = 0.351 \text{ kN}$

nail anchorage capacities (shear), simplified method

main beam $f_{h,k} = 18.935 \text{ N/mm}^2$ $R_{1a,k} = 1.016 \text{ kN}$ $R_{1a,d} = 0.554 \text{ kN}$ $t_{req} = 40.0 \text{ mm}$

dowel anchorage capacities (shear), simplified method NA:2010-12

secondary beam $f_{h,k} = 16.507 \text{ N/mm}^2$ $R_{k} = 4.651 \text{ kN}$ $R_{d} = 2.537 \text{ kN}$ $t_{req} = 85.9 \text{ mm}$

load-carrying capacity concealed beam hanger

material safety factors $\gamma_{M,timber} = 1.30$ $\gamma_{M,steel} = 1.10$

load-carrying capacity main beam connection $R_{1,k} = R_{1a,k} = 1.016 \text{ kN}$ $R_{1,d} = 0.554 \text{ kN}$ (1)

number of nails $n_{Na} = 20$ $\gamma_{M,calc} = 1.10$

$F_{1,d} = 1.50 \text{ kN}$ $R_{1,d} = 11.09 \text{ kN}$ $F_{1,d}/R_{1,d} = 0.14 \leq 1.00$ verification successful

load-carrying capacity secondary beam connection (2)

number of dowels $n_{st} = 3$ $\gamma_{M,calc} = 1.10$

$F_{r,d} = 2.16 \text{ kN}$ $R_{1,d} = 15.22 \text{ kN}$ $F_{r,d}/R_{1,d} = 0.14 \leq 1.00$ verification successful

decisive is secondary beam-load-carrying capacity $R_{1,d} = 15.22 \text{ kN}$

verification of splitting capacity (3)

For $a/H_H = 0.478 \leq 0.7$ verif. of splitting capacity is required.

Es the following requirement should be satisfied: $F_{90,d} / R_{90,d} \leq 1.0$

$F_{90,d}$ design value of the force component perpendicular to grain

$R_{90,d}$ design splitting capacity of the beams

$R_{90,d} = k_s * k_r * (6.5 + 18.*a^2/H_H^2) * (t_{ef}*H_H)^{0.8} * f_{t,90,d}$

$a = 153.0 \text{ mm}$ $H_H = 320.0 \text{ mm}$ $a/H_H = 0.478$ $a_r = 46.0 \text{ mm}$ $t_{ef} = 35.0 \text{ mm}$

$h_1 = 167.0 \text{ mm}$ $k_s = 1.000$ $k_r = 1.423$ $l_{Ag} = 46.0 \text{ mm}$ $k_g = 1.000$

$f_{t,90,k} = 0.400 \text{ N/mm}^2$ $f_{t,90,d} = 0.185 \text{ N/mm}^2$ $F_{90,d} = 1.50 \text{ kN}$ $R_{90,d} = 4.84 \text{ kN}$

$F_{90,d} / R_{90,d} = 1.50 / 4.84 = 0.31 \leq 1.0$ verification successful

LK1: all verifications successful.

summary

maximum utilization max U = 0.31, decisive load combination 1, verification 3